

MOLLUSKS OF THE PLIOCENE DEPOSITS AT  
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Of the post-Eocene lake deposits so widespread in the west, those of the Great Basin region were first and are still chiefly known from King's reports in the U. S. Geological Exploration of the Fortieth Parallel. King indicated certain extensive deposits of Pliocene age as having been laid down in a great sheet of water lying chiefly in Nevada to which he applied the name Shoshone Lake. The margins of this lake touched southeastern Oregon, eastern and southeastern California, and the western half of Utah. The deposits made in this lake, the limits of which have never been definitely plotted, have commonly been designated as the "Humboldt Group." Frank B. Meek as long ago as 1870 reported extensive studies on the molluscan fauna of the extinct lake, particularly from deposits at Fossil Hill, Kawsoh Mts. of Nevada, and from Cache Valley, Utah.

The writers have devoted considerable time to an investigation of the molluscan fossils of this formation in various exposures in Utah and Idaho; and the present paper is a report upon our findings in a conspicuous outcropping at Collinston, Utah. This deposit seems clearly continuous with that at Mendon, in Cache Valley, thus Pliocene strata bending about the north end of the Wasatch Range from one locality to the other.

The tertiary outcropping in Collinston, Utah, is similar in formation and fauna to that occurring further east near Mendon, Utah, the locality visited by Meek. The Collinston outcropping is several hundred feet in height and is composed chiefly of conglomerates and oolitic sands. Unfortunately the molluscan remains at most levels are composed of molds and casts in the conglomerates, making identification of the species very difficult. We found a stratum, however, situated about midway between the base and the summit of the mountain, which is composed of fine, unconsolidated sands and yielding fossil shells in good condition and in

large numbers. The majority of the specimens of this stratum are species which are small in size or immature shells of larger species. It is from this stratum that most of the species listed in this paper were obtained. Types of all new species are in the museum of the University of Utah.

We wish to extend our thanks to Dr. Walter P. Cottam for aid in photographing the specimens.

PISIDIUM COMPRESSUM Prime. Pl. 5, fig. 1.

A number of valves of this species were found in the fine sand. Occasionally both valves were found intact.

SPHAERIUM PILSBRYANUM Sterki. Pl. 5, fig. 2.

A few specimens found. They are of smaller size than the adult forms found living at the present time. The largest found is 10.4 mm. long by 8.7 mm. high.

STAGNICOLA KINGI (Meek). Pl. 5, fig. 3.

Several molds and a few well preserved casts have been discovered in the consolidated oolitic sands and conglomerates. No actual complete shells were found, however, at this locality. This species became a dominant form during the Pleistocene in Lake Bonneville. It is living at present in two widely separated districts, one in Utah Lake on the west shore, the other in northern Utah near Promontory.

PHYSA sp. Pl. 5, fig. 4.

This is a juvenile form. Although it appears to be different from any described species, we think it advisable to postpone giving it a name until better material makes possible an adequate description.

VORTICIFEX LAXUS sp. nov. Pl. 5, fig. 5.

This species, although common in the conglomeritic deposits, was absent in the sands. The description of the species is taken from the aspects which the mold and the casts reveal. Specimens with the shell present have not been taken by us.

*Description:* Shell large and varying from a depressed spire to a low spire. Whorls  $3\frac{1}{2}$  to 4. The sutures evident-

ly deep causing the mold to be loosely coiled. The last whorl large but lacking the terraced shoulder that is present on *Carinifex newberryi* (Lea) which it somewhat resembles. There is no evidence of a sharp carina surrounding the umbilicus as is present on *C. newberryi*. Aperture is triangular-ovate, large and expanding, having its widest dimensions at the periphery. Umbilicus very narrow. *Size*: 21.8 mm. wide; 21 mm. high; penultimate whorl 11.4 mm. wide; aperture 16 mm. high, 12.3 mm. wide.

This species appears to be related to *Vorticifex binneyi* (Meek) but differs from that species in that the whorls increase less rapidly in size, in the shape of the aperture (*binneyi's* aperture being widest above), in the height of the spire, and in the width of the umbilicus.

VORTICIFEX TRYONI CONCAVA Meek. Pl. 5, fig. 6.

Three specimens of this form were found in the fine sands. All three have the characteristic transverse costae, but are not fully mature shells. The largest specimen had  $3\frac{1}{4}$  whorls and measured 3.4 mm.

GYRAULUS MONOCARINATUS sp. nov. Pl. 5, figs. 7 and 8.

*Description*: Shell small, discoidal, composed of  $2\frac{1}{2}$  to 3 whorls which increase rapidly in size. Nuclear whorl round and non-carinated. The last two whorls are strongly keeled above the periphery causing the upper portion of the whorls to slope downward to the sunken spire. The upper portion of the body whorl is channeled between the keeled body whorl and penultimate whorl. Below the carina the body whorl is well rounded. The umbilicus is excavated allowing all the whorls to be seen from beneath. Aperture, angulate, large, and wider than high. *Size*: 3.8 mm. wide, 1.9 mm. high.

This species, with its characteristic keel does not seem to be closely related to any species that we are familiar with. It was found to be rather common in the fine sand strata and also in the coarse, unconsolidated sands.

GYRAULUS ANNECTANS sp. nov. Pl. 5, figs. 9 and 10.

*Description*: Shell small composed of  $2\frac{1}{4}$  to  $2\frac{1}{2}$  whorls which increase very rapidly in size, the last comprising most of the shell. The whorls are loosely coiled and sculptured with evenly placed transverse costae. Spire sunken,

protoconch extremely small, gradually increasing in size with the younger whorls. Body whorl abruptly rounded. Umbilicus wide and circumscribed with a well defined carina. Aperture obtusely ovate, wider than high, slightly everted on adult forms. *Size*: 4.5 mm. wide, 1.6 mm. high; penultimate whorl 1.3 mm. wide; aperture 2.5 mm. wide, 1.6 mm. high.

This species has combined characteristics of the genera *Gyraulus* and *Carinifex* not fitting perfectly into either one as they are now established. It differs from *Gyraulus* in having a carina surrounding the umbilicus, but differs from *Carinifex* in not possessing a terraced spire and in the shape of the aperture. The species was well represented in the fine sand strata and in the coarse sand directly above associating with the last species described, *Gyraulus monocarinatus*.

LANX UNDULATUS (Meek). Pl. 5, fig. 11.

Several specimens of this species were found, none, however, being as large as that of the type species as described by Meek from Fossil Hill, Kaw-soh Mountains, Nevada. The largest specimen found measured 9.1 mm. long; 7.6 mm. wide; and 6.4 mm. high. Undulations were well developed on most of the specimens and the contour of the shell including the position and shape of the apex are similar to the species as described by Meek. It is no longer living in the Great Basin.

AMNICOLA LIMOSA (Say). Pl. 5, fig. 12.

A few well preserved specimens were found of this species in the coarse, unconsolidated sands. This species is still living in a few isolated districts of Utah, e.g., Salt Springs, Utah.

PALUDESTRINA NANNA sp. nov. Pl. 5, figs. 13 and 14.

Six specimens of this species were found in the fine sands and in the strata directly above. Only two had their shells remaining. The other specimens had some portions of the shell present but were mostly composed of the molds.

*Description*: Shell small, rimate, narrowly elongate. Whorls  $4\frac{1}{2}$  to 5, somewhat shouldered, convex, nearly



UPPER—Hill at Collinston, Utah.

LOWER—Nearer view of a portion of the hill to show the characteristic dip and the sandy layers between more consolidated strata.